CHRISTEN ✱ PRODUCT LETTER

No: 000331

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By: FLC Date: 09-19-83 Page: 1 of 1

Send To: PRODUCTS 901 THRU 925

C * MULTIPLE LETTER MAILING *
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S SEE FIRST LETTER FOR
T NAME AND ADDRESS.

Subject: PROPELLER FLANGE FAILURES ON LYCOMING ENGINES AND LYCOMING SERVICE BULLETIN 465 ISSUED ON 08-26-83.

*** IMPORTANT! RESPONSE TO THIS LETTER MAY BE CRITICAL FOR FLIGHT SAFETY ***

There have been two recent incidents of failure of the crankshaft propeller mounting flange with resultant loss of the propeller on aerobatic aircraft using the AVCO/Lycoming AEIO-360-A series 200 hp engine.

Both failures occurred on Pitts Special S-1 series aircraft. As a result of their small size and very high maneuverability, these aircraft are capable of performing aerobatic maneuvers which impose very high loads on the propeller and the crankshaft propeller mounting flange, particularly if the propeller is the constant-speed type which is heavier than the fixed-pitch type.

No reports of similar failures have been received for larger aircraft such as the Pitts Special S-2 series or the Christen Eagle II aircraft. The reduced maneuverability of these larger aircraft results in lower propeller loads during the performance of aerobatic maneuvers.

In response to these failures AVCO/Lycoming has redesigned the crankshaft for their AIO and AEIO series aerobatic engines. The new crankshaft has a thicker propeller mounting flange with no lightening holes and with a larger radius between the flange and the forward diameter of the crankshaft. The new crankshaft will be used on all aerobatic engines shipped after January 16, 1983.

Enclosed is AVCO/Lycoming Service Bulletin 465 which describes the new crankshaft and which requires future inspection of the crankshaft flange at regular intervals on existing engines used in aerobatic aircraft. All Eagle aircraft owners should perform the required inspections to ensure safe aerobatic operation of their aircraft.

Please note the phrase "unauthorized maneuvers" in the paragraph below Figure 2 on the back of the Service Bulletin. To our knowledge AVCO/Lycoming has never stated or implied in any of their publications that any maneuvers are unauthorized. In addition, neither Christen Industries or Pitts Aerobatics has ever indicated that any maneuvers are unauthorized. The AVCO/Lycoming reference to such maneuvers is apparently an error.

ENCLOSURE: AVCO/Lycoming Service Bulletin 465

AVCO LYCOMING DIVISION
WILLIAMSPORT, PENNSYLVANIA 17701

Service Bulletin

(L)

DATE: August 26, 1983

Service Bulletin No. 465
Engineering Aspects are
FAA Approved

SUBJECT: Redesigned Crankshaft for Aerobatic Engines.

MODELS AFFECTED: AIO-320-A1B, -B1B, -C1B with serial number L-108-65A and up; AEIO-320-D1B, -D2B, -E1A, -E1B, -E2A, -E2B with serial number L-5873-55A and up; AIO-360-A1A, -A1B, -B1B with serial number L-258-63A and up; AEIO-360-A1A, -A1B, -A1B6, -A1D, -A1E, -A2B, -B1F, -B1G6, -B2F, -B4A, -H1A with serial number L-23428-51A and up; AEIO-540-D4A5, -D4B5 with serial number L-22157-48A and up.

Remanufactured engines shipped after January 26, 1983.

NOTE

Engine models listed above will be equipped with the new heavy flange crankshaft commencing with the listed serial number. Engines with serial numbers below the listed serial number are equipped with the lighter flange crankshaft and are subject to the inspection requirements listed below.

TIME OF COMPLIANCE: Inspect crankshaft flange every 25 hours of operating time: Replace crankshaft at overhaul or earlier at owner's discretion.

It has been determined that excessive stress from aerobatic maneuvers can cause cracking and the eventual failure of the crankshaft propeller mounting flange. To reduce the risk of propeller flange failure, Avco Lycoming has re-designed the propeller mounting flange on crankshafts assembled in engines built for installation in aerobatic aircraft. These new crankshafts incorporate a thicker flange. In addition, the lightening holes are omitted, where applicable. Operators of Lycoming powered aircraft involved in aerobatic maneuvers are urged to install this new crankshaft at the earliest convenience.

To avoid propeller flange failure on aerobatic engines utilizing a crankshaft with lightening holes and thinner propeller flange, the following inspections must be accomplished:

1. After every 25 hours of operation, the propeller and starter ring gear support must be removed and the propeller mounting flange must be visually inspected. Use a 10X power magnifying lens with adequate light. Inspect the entire flange area from the crankcase oil seal forward. Pay particular attention to the rear face and fillet radius of the propeller flange. See Figure 1. Figure 2 shows an area of the propeller flange with cracks developing.

2. After 200 hours of operation and at 100 hour intervals thereafter, the propeller mounting flange must also be examined with portable magnetic particle inspection equipment. A record of each visual and magnetic particle inspection should be entered in the engine logbook.

NOTE

Lycoming does not recommend using the dye penetrant method for this inspection.

Crankshafts with light weight flanges that are removed from Aerobatic engines at overhaul, or for the purpose of installing a new heavy flange crankshaft must be scrapped. It is not permissible under any circumstances to reuse any light weight flange

TEXTRON Lycoming

Reciprocating Engine Division/
Subsidiary of Textron Inc.
652 Oliver Street
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MANDATORY

SERVICE BULLETIN

DATE: July 2, 1993

Service Bulletin No. 465C
(Supersedes Service Bulletin No. 465B)
Engineering Aspects are
FAA Approved

SUBJECT: Crankshaft Flange Inspection for Aerobatic Engines

MODELS AFFECTED:

AIO-360-A1A, -A2A, -A1B, -A2B, -B1B with Serial Nos. up to and including L-257-63A.
AEIO-360-A1A, -A1B, -A1B6, -A2A, -A1C, -A2C, -A1D, -A1E, -A2B, -B1B, -B1D, -B1F, -B1F6, -B2F, -B2F6, -B4A, -H1A with Serial Nos. up to and including L-23521-51A.

Remanufactured engines of these models shipped before June 1, 1983.

Engine models above the affected serial number and remanufactured engines shipped on or after June 1, 1983 incorporate a redesigned crankshaft and are not subject to this bulletin.

TIME OF COMPLIANCE:

At next overhaul or disassembly the following Procedure I must be complied with. Until that time, the periodic inspections in Procedure II or Procedure III must be complied with.

Procedure I

1. Remove engine from aircraft and disassemble per applicable overhaul manual.
2. Install new redesigned crankshaft and reassemble engine in accordance with applicable overhaul manual.

   NOTE: Table 1 lists applicable crankshaft part numbers.
3. Make logbook entry.

Procedure II

Visually inspect within next 25 hours of operation and every 25 hours thereafter. Logbook entry must be made upon completion of this procedure.

NOTE: The initial inspections must be performed as directed. However, if no subsequent aerobatic maneuvers are practiced, additional inspections are not required. If any subsequent aerobatic maneuvers are practiced, inspection is required in accordance with the above.

OR

Procedure III

Use Magnetic Particle Inspection within next 25 hours of operation and every 100 hours thereafter. Logbook entry must be made upon completion of this procedure.

NOTE: The initial inspections must be performed as directed. However, if no subsequent aerobatic maneuvers are practiced, additional inspections are not required. If any subsequent aerobatic maneuvers are practiced, inspection is required in accordance with the above.

General Aviation
Manufacturers Association

Service Bulletin No. 465 was issued on August 26, 1983. The bulletin addressed safety of flight for all aerobatic engines. Continued investigation has disclosed that certain engine models have not experienced crankshaft flange problems. All affected engine models incorporate lightening holes in the crankshaft propeller flange.

Crankshafts with lightening holes in the flange, have proven reliable for over 15 years of aerobatic service. Textron Lycoming is unable to determine the operating conditions that induce the excessive stress in the crankshaft propeller flange; this is a function of aerobatic maneuver, operating RPM, propeller configuration, and aircraft dynamic response. It is therefore evident that additional stresses are being induced by one or more of the above variables. Under no circumstances should the maximum rated RPM of 2700 be exceeded. Reference latest edition of Service Bulletin No. 369.

INSPECTION PROCEDURE I

1. Remove propeller.

2. Remove nose cowling to provide access to front of engine.

3. Remove starter ring gear and alternator belt.

4. Visually inspect the rear face of the propeller flange. Use a 10X power magnifying lens with adequate light. Inspect the entire flange area from the crankcase oil seal forward. Pay particular attention to the rear face and fillet radius of the propeller flange. See Figure 1. Figure 2 shows an area of the propeller flange with cracks developing.

5. Reinstall all removed parts in the reverse order of removal.

NOTE

All propeller mounting bolts must be reinstalled, torqued and safety wired per the propeller manufacturer's instructions.

6. Make a suitable logbook entry for this inspection.

INSPECTION PROCEDURE II

1. Repeat steps 1, 2, and 3 of Visual Inspection Procedure.

2. Loosen alternator attaching bolts allowing alternator to swing out and down, away from the crankshaft area.

3. Prepare flange area for magnetic particle inspection by using Methyl-Ethyl-Ketone (MEK) or other suitable solvent to remove all traces of paint and other foreign material.

CAUTION

DO NOT REMOVE THE CADMIUM PLATING.

4. After the flange area is clean and dry, spray Magnaflux Corp. 14AM bath solution or equivalent liberally onto flange area as depicted in Figure 1.

5. Center Magnaflux Corp. L10 coil or equivalent over flange and press switch to activate current for 15 to 20 seconds.

6. Release switch and remove coil; inspect flange area as in Figure 1 & 2 for cracks using ultraviolet light.

NOTE

When using the Magnaflux Corp. ZB26 black light or equivalent during the inspection, it may be necessary to shield all outside light with a suitable cover such as a tarpaulin.

7. After completing the inspection, it is required that the flange area be demagnetized as follows:

8. Center the coil around the flange as originally done in step 7. Press the switch and hold in the "on" position. Slowly remove coil from crankshaft by backing away, keeping the coil on a direct line with the crankshaft. It is necessary to step back a minimum of 6 feet in order to assure complete demagnetization.

NOTE

To detect residual magnetism in the flange, perform the following test as shown in Figure 3. Hold a field indicator approximately 1/8-inch from the flange. If needle moves more than one (1) indication from zero (0), repeat the demagnetization procedure in step 8.

An alternate method for detecting residual magnetism in the propeller flange is to suspend a steel paper clip approximately 1/8-inch from the flange, per Figure 3. Any appreciable magnetism will attract the paper clip.

9. Remove the magnetic particle bath solution by flushing with kerosene or other suitable solvent.

10. Reinstall all removed parts in the reverse order of removal.

NOTE

All propeller-mounting bolts must be reinstalled, torqued and safety wired per the propeller manufacturer's instructions.

11. Make a suitable logbook entry for this inspection.

The magnetic-particle inspection must be performed by an FAA approved facility.

EQUIPMENT REQUIRED

One (1) 100-watt blacklight, (115-volts)
One (1) coil, 115-volts, AC, with 25-foot power cord. (A 75-foot extension cord may be used.)
Magnaflux 14AM or equivalent fluorescent bath solution. (Gray recommended by Textron Lycoming.)
One (1) Field Indicator, RB Annis Model 20 or equivalent.

MATERIAL REQUIRED FOR PROCEDURE III (Crankshaft Replacement)

TABLE 1

CRANKSHAFT PART NUMBER	MODELS AFFECTED	HEAVY WALL BEARING KIT	THIN WALL BEARING KIT
13B17179 or 13B27139	AIO-360-A1A,-A1B,-B1B	LW-19049	LW-19052
13B17182 or 13B27142	AIO-360-A2A,-A2B	LW-19049	LW-19052
13B17176 or 13B27128	AEIO-360-A1A,-A1B,-A1C,-A1D,-A1E	LW-19050	LW-19053
13B17258	AEIO-360-A1B6	LW-19049	LW-19052
13B17260	AEIO-360-B2F6	LW-19051	LW-19054
13B17180 or 13B27129	AEIO-360-A2A,-A2B,-A2C	LW-19050	LW-19053
13B17259	AEIO-360-B1F6	LW-19051	LW-19054
13B17177 or 13B27120	AEIO-360-B1B,-B1D,-B1F,-H1A	LW-19051	LW-19054
13B17178 or 13B27122	AEIO-360-B2F	LW-19051	LW-19054
13B17144 or 13B27134	AEIO-360-B4A	LW-19051	LW-19054

TABLE 2

HEAVY-WALL BEARING KITS

KIT P/N LW-19049

LW-13884	Bearing, Front	2 each
LW-16047	Bearing, Main	4 each
LW-13212	Bearing, Rod	8 each
74241	Ring, Piston	8 each
73857	Ring, Piston	4 each
75060	Bolt, Con/Rod	8 each
LW-12186	Nut, Con/Rod	8 each
LW-10964	Seal & Gas/Set	1 each

THIN-WALL BEARING KITS

KIT P/N LW-19052

LW-13884	Bearing, Front	2 each
LW-16711	Bearing, Main	4 each
LW-13212	Bearing, Rod	8 each
74241	Ring, Piston	8 each
73857	Ring, Piston	4 each
75060	Bolt, Con/Rod	8 each
LW-12186	Nut, Con/Rod	8 each
LW-10964	Seal & Gas/Set	1 each

TABLE 2 (Cont.)

HEAVY-WALL BEARING KITS (Cont.)

KIT P/N LW-19050

LW-13884	Bearing, Front	2 each
LW-16047	Bearing, Main	4 each
74309	Bearing, Rod	8 each
74241	Ring, Piston	8 each
73857	Ring, Piston	4 each
75060	Bolt, Con/Rod	8 each
LW-12186	Nut, Con/Rod	8 each
LW-10964	Seal & Gas/Set	1 each

KIT P/N LW-19051

LW-13884	Bearing, Front	2 each
LW-16047	Bearing, Main	4 each
LW-13521	Bearing, Rod	8 each
74241	Ring, Piston	8 each
73857	Ring, Piston	4 each
75061	Bolt, Con/Rod	8 each
LW-12186	Nut, Con/Rod	8 each
LW-10964	Seal & Gas/Set	1 each

THIN-WALL BEARING KITS (Cont.)

KIT P/N LW-LW-19053

LW-13884	Bearing, Front	2 each
LW-16711	Bearing, Main	4 each
74309	Bearing, Rod	8 each
74241	Ring, Piston	8 each
73857	Ring, Piston	4 each
75060	Bolt, Con/Rod	8 each
LW-12186	Nut, Con/Rod	8 each
LW-10964	Seal & Gas/Set	1 each

KIT P/N LW-LW-19054

LW-13884	Bearing, Front	2 each
LW-16711	Bearing, Main	4 each
LW-13521	Bearing, Rod	8 each
74241	Ring, Piston	8 each
73857	Ring, Piston	4 each
75061	Bolt, Con/Rod	8 each
LW-12186	Nut, Con/Rod	8 each
LW-10964	Seal & Gas/Set	1 each

The following AEIO-360-A1A, -A1B6, -B1F, -B2F were manufactured with thin-wall, high-crush bearings:

AEIO-360-A1A . . . . S/N L-23393-51A
AEIO-360-A1B6 . . . . S/N L-23323-51A
AEIO-360-B1F . . . . S/N L-23364-51A, L-23365-51A, L23556-51A thru L-23560-51A, L-23577-51A thru L-23586-51A, L-23598-51A thru L-23607-51A.
AEIO-360-B2F . . . . S/N L-23281-51A thru L-23291-51A, L-23522-51A, L-23544-51A, L-23545-51A, L-23546-51A, L-23649-51A, L-23650-51A, and L-23651-51A.

Contact your Textron Lycoming Distributor for the special exchange price.

NOTE: This special Crankshaft and Kit price is only available to owners of engines listed on this bulletin by serial number.

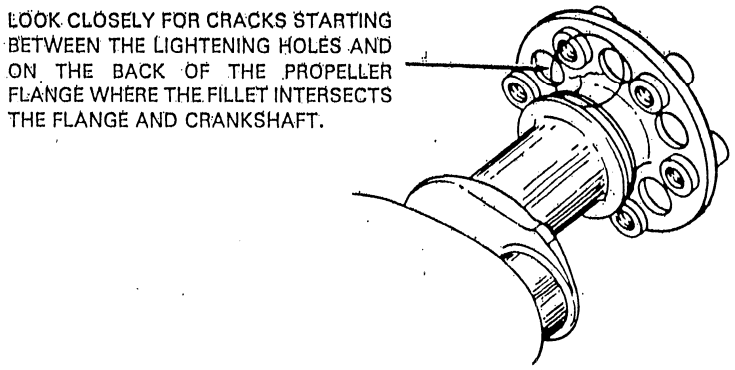


Figure 1. Rear View of Propeller Mounting Flange Showing Area of Lightening Holes.

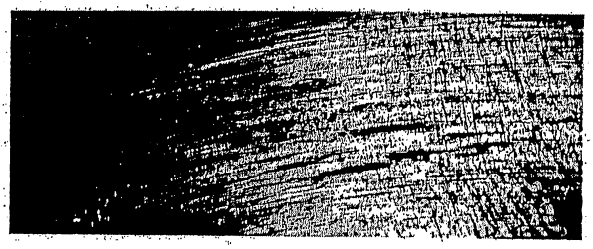
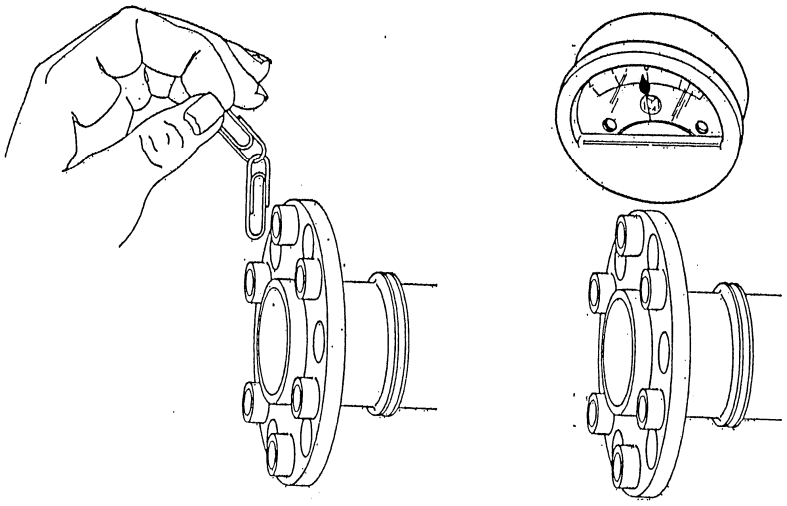


Figure 2. 10X Magnified View Showing Appearance of Area Cracked Due to Abnormal Loading Imposed on the Propeller Flange During Periods of Aerobatic Maneuvers.



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A rotating, magnetized propeller flange could set up a magnetic field strong enough to magnetize check valves in the hydraulic lifters and to interfere with flux fields in the magnetos and avionics.

Figure 3. Residual Magnetism in the Propeller Flange can be Detected with a Field Indicator or a Suspended Steel Paper Clip.

NOTE: Revision "C" revises part numbers and text.

21818, 21818A, 21818B, 24115, 24115A — These numbers for Textron Lycoming reference only.